InnoMerge & VPMS

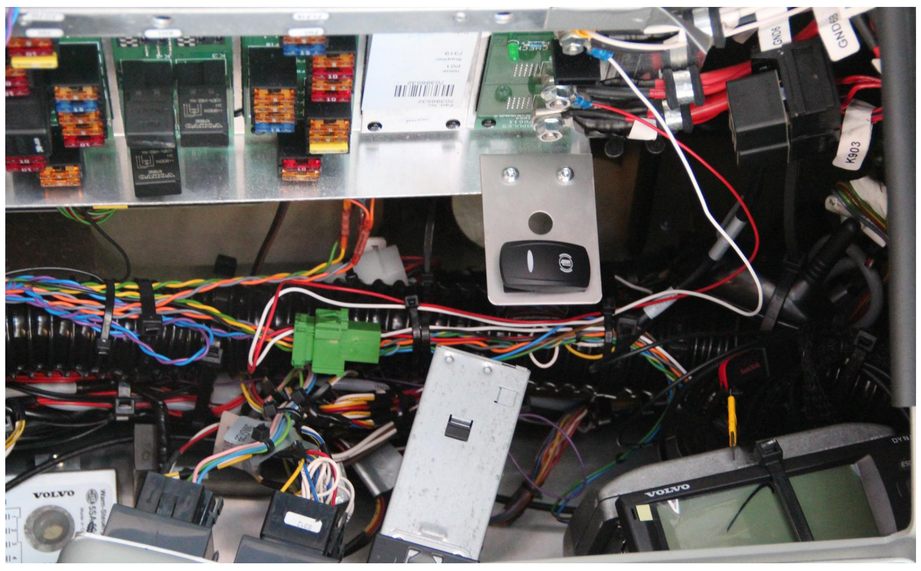
Volvo Technology, Volvo Trucks, Volvo Construction Equipment, Chalmers University of Technology, Halmstad University, Andreassons Åkeri AB, S Blomquist Entreprenad AB

CAISR Centre for Applied Intelligent Systems Research

Knowledge Foundation

The InnoMerge project addresses the challenges related to the major growth opportunities expected to be found in emerging markets such as India and East Asia. The main objective of the project as a whole is to build knowledge on how advanced technologies and business models can be transferred to, and from, an emerging market context. This should lead to speed up in the adoption of more sustainable truck solutions, including environment and traffic safety.

InnoMerge targets uptime and traffic safety as primary application areas, including the development and testing of business models and technology for on-board diagnostics, predictive maintenance and intelligent monitoring.

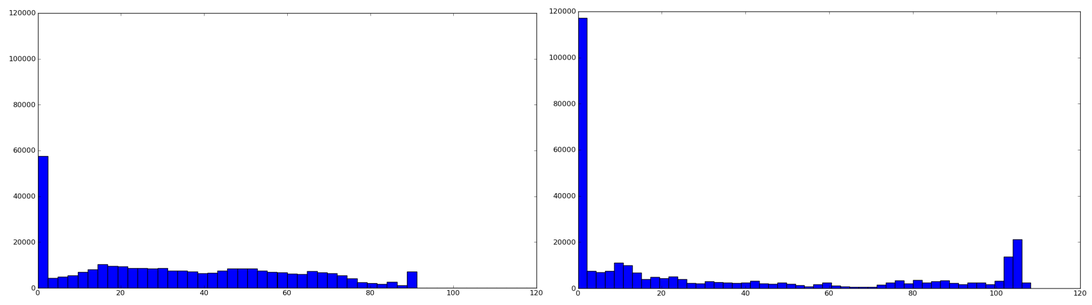


From CAISR perspective, the main challenge is how to adapt data mining algorithms to settings with a lot less data available, and a significantly less developed knowledge base. This is an interesting exercise in scalability, since where modern high-end truck in European market can have up to 50 electronic control units, in InnoMerge we expect to be working with vehicles containing 3 to 5 ECUs. Moreover, in western markets Volvo has a quite complete database of service events, going several years back, but there is no equivalent knowledge base in India or China.

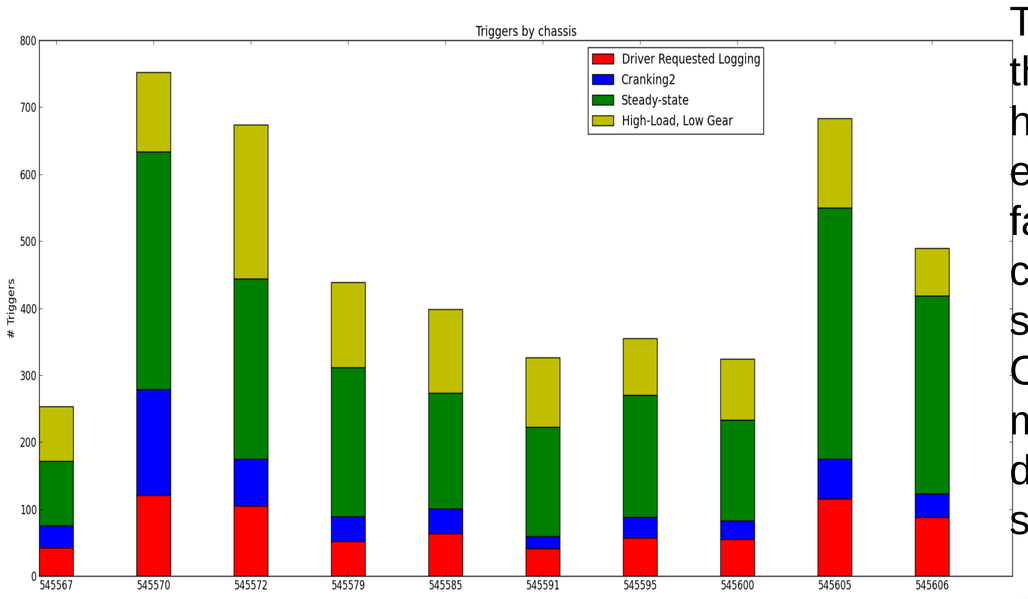
InnoMerge also aims at increasing cooperation between Swedish, Indian and Chinese academia and industry.

The Volvo Predictive Maintenance Solution project's main goal is to validate predictive maintenance algorithms that are being developed by Halmstad University and Volvo Technology on a fleet of ten long-haul trucks operating in North America.

Vehicle signals collected within VPMS will be analysed using artificial intelligence and data mining methods based on ideas explored and developed in a number of earlier projects. We start by find interesting relationships between signals, compare them between different trucks and flag deviations, i.e. situations where an individual vehicle behaves differently than the rest of the fleet.
An interesting aspect of our data logging system is that it is fully unattended, with all data being transmitted wirelessly from vehicles to a central server. Therefore, it is not possible to stream all signals continuously, and data is stored on-board the truck in a buffer and only transmitted, in bursts, when certain trigger conditions are met.



The above plots show a comparison of Vehicle Speed histogram between system which gathers data continuously (on the left) and one that uses triggers (on the right). It can be seen that there is some difference in behaviour due to usage of those two systems, but nevertheless, idle runs are significantly overrepresented in the second dataset.



Those triggers are starting the engine, running at high torque low speed, etc. The idea is that both faults and wear are most clearly visible when the system is under stress. On the other hand, it makes analysis more difficult, since the data is skewed.

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